**UNITED STATES DISTRICT COURT**
**EASTERN DISTRICT OF MICHIGAN**
**SOUTHERN DIVISION**

*In re* Flint Water Cases

Judith E. Levy
United States District Judge

_____/

This Order Relates To:

*Bellwether I Cases*
Case No. 17-10164
_____/

**OPINION AND ORDER GRANTING IN PART AND DENYING IN PART DEFENDANTS VEOLIA NORTH AMERICA, LLC, VEOLIA NORTH AMERICA, INC., AND VEOLIA WATER NORTH AMERICA OPERATING SERVICES, LLC'S MOTION TO EXCLUDE THE TESTIMONY AND REPORT OF DR. WILLIAM BITHONEY [335]**

This opinion is the fourth in a series addressing the admissibility of the testimony and reports of eight experts retained by Plaintiffs in anticipation of the first bellwether trial, currently set to begin on February 15, 2022. Defendants argue that none of these experts can meet the standards set by Federal Rule of Evidence 702 and *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579 (1993).

Currently before the Court is the motion by Veolia North America, LLC, Veolia North America, Inc., and Veolia Water North America Operating Services, LLC (collectively "VNA") to exclude the testimony and reports of Dr. William Bithoney (ECF No. 335.) The LAN and LAD Defendants join VNA's motion. (ECF No. 344.) For the reasons set forth below, VNA's motion to exclude is GRANTED IN PART and DENIED IN PART.

## I. Background

Dr. William Bithoney is a medical doctor with over 40 years of experience diagnosing and treating lead exposed children. (ECF No. 436, PageID.33913-33919). He is currently a consulting physician for the NAACP Lead Poisoning Project in Indiana and the Chief Medical Officer at Ninth Dimension Biotech. (ECF No. 373-2, PageID.24686.) Dr. Bithoney's qualifications as an expert are not disputed.

Plaintiffs seek to offer Dr. Bithoney as an expert on both general and specific causation. They retained Dr. Bithoney to determine (1) whether lead-poisoning *could* cause the adverse health effects they have experienced (general causation), and (2) whether lead-poisoning in fact *did* cause those adverse effects (specific causation) in the four bellwether

Plaintiffs. Some of Dr. Bithoney's expected testimony is also relevant to the element of injury. Dr. Bithoney's opinions as to each element are summarized below.

**A. General Causation Opinions**

Dr. Bithoney indicates that there is a very strong scientific consensus that exposure to lead, even in very small quantities, can cause the neurocognitive symptoms experienced by Plaintiffs.

Dr. Bithoney first notes that lead exposure can cause decreased academic achievement. (*E.g.,* ECF No. 330-19, PageID.15042.) That conclusion is primarily based on a study which showed that for every 1 μg/dl increase in blood-lead concentration, there was a 0.7 point decrease in arithmetic scores, a 1 point decrease in reading scores, a 0.1 point decrease in scores on a measure of nonverbal reasoning, and a 0.5 decrease in scores on short-term memory tests. Bruce P. Lanphear et. al., *Cognitive Deficits Associated with Blood Lead Concentrations <10 mcg/dl in U.S. Children and Adolescents*, 115 Public Health Reports 521 (2000) ("Lanphear (2000)"); *See also* ECF No. 330-19, PageID.15043 (discussing Lanphear study).

Dr. Bithoney also considers research that addresses the causal link between overall decrements in intelligence and lead exposure. As early as the 1990s, studies found that minimal exposures to lead could cause decreases in IQ. A 1994 meta-analysis found with a margin of error of less than 0.001% that lead poisoning could cause decreases in IQ at blood lead levels as low as 1 μg/dl. Joel Schwartz, *Low-Level Lead Exposure and Children's IQ: A Meta-analysis and Search for a Threshold*, 65 Environmental Research 42, 53 (1994) ("Schwartz (1994)"). So far, no study has discovered any threshold below which lead does not cause such harms.

Dr. Bithoney testified that he further reviewed the *Toxicological Profile for Lead*, an exhaustive literature review published by the Agency for Toxic Substances and Disease Registry ("ATSDR"). (ECF No. 436, PageID.34038-34039.) The *Toxicological Profile* is one of the most authoritative sources available on the topic of lead poisoning. It, too, concludes that lead can cause decrements in intelligence at very low levels of exposure. *See* ATSDR, *Toxicological Profile for Lead* (Aug. 2020) (https://www.atsdr.cdc.gov/ToxProfiles/tp13.pdf) ("Toxicological Profile"),

at 140-176 (reviewing published studies showing a link between lead exposure and decreases in IQ).

Dr. Bithoney next opines that lead exposure can cause neurobehavioral concerns, including attention deficit hyperactivity disorder ("ADHD"). His report cites to several studies supporting that conclusion. A study by Lisa M. Chiodo reviewed what is known as lead's "behavioral signature," which includes symptoms "in the specific domains of attention, executive function, visual-motor integration, social behavior, and motor skills." Lisa M. Chiodo et al., *Neurodevelopmental effects of postnatal lead exposure at very low levels,* 26 Neurotoxicology and Teratology 3, 359-371, at 359 (2004) ("Chiodo (2004)"). Chiodo concludes that lead poisoning is directly associated with "higher ADHD and inattention scores…and poorer attention." *Id.* at 365. Moreover, according to Chiodo, toddlers exposed to lead "had more difficulties with emotion regulation and behavior orientation." *Id.* at 368. Other studies draw similar conclusions. *See, e.g.,* Joe M. Braun, *Exposures to Environmental Toxicants and Attention Deficit Hyperactivity Disorder in U.S. Children*, 114 Environmental Health Perspectives 12 (2006) ("Braun

(2006)") (estimating that 290,000 U.S. cases of ADHD are caused by lead exposure).

Dr. Bithoney further mentions that those who are exposed to lead face an increased risk of other health conditions, such as "cardiovascular disease, hypertension, renal disease, and neurologic deficits." (ECF No. 330-17, PageID.15015.)

Based on these sources, the *Toxicological Profile*, and an informational website on the health effects of lead published by the National Institute of Environmental Health Sciences,[1] Dr. Bithoney concludes that any amount of lead in the body can cause neurocognitive harms. (*See* ECF No. 330-17, PageID.15014.)

**B. Specific Causation Testimony**

Dr. Bithoney then turns to the four individual bellwether Plaintiffs to consider whether exposure to lead was the cause of *their* neurocognitive injuries. According to Dr. Bithoney, each of the Plaintiffs' neurocognitive injuries was likely caused by lead-poisoning.

[1] *See* "Lead and Your Health," *National Institute of Environmental Health Sciences*, May 2021, available at https://niehs.nih.gov/health/materials/lead_and_your_health_508.pdf.

While COVID-19 prevented Dr. Bithoney from personally examining each Plaintiff, he did conduct thorough interviews with each of the Plaintiffs' parents. (ECF No. 436, PageID.33888-33889.) In his deposition, Dr. Bithoney explains that he took a "very extensive history" during those interviews:

> I got a social history, where did they live…when did they live [there], family history, genetic history, history of developmental difficulties in the family members, past medical history, history of hospitalizations, what's called a review of systems, headaches, nausea, vomiting, blurred vision, double vision, cough up blood, trouble hearing, trouble seeing, asthma, difficult[y] breathing, gastrointestinal disease, rashes, broken bones, evidence of child abuse. Just a very extensive history.

*Id.* at PageID.33889. Dr. Bithoney also collected information about how much water each Plaintiff ingested, when, and in what form. *Id.* Finally, Dr. Bithoney questioned each parent about potential sources of lead around the house. (*Id.* at PageID.34151.)

In addition to these interviews, Dr. Bithoney relied on the reports of Dr. Mira Krishnan (Plaintiffs' expert psychologist),[2] medical and school records for each Plaintiff, all lead exposure assessments taken of each Plaintiff (both bone and blood tests), and several secondary sources on the Flint Water Crisis. Dr. Bithoney also hired a graduate student to conduct block-by-block "geomapping" of Plaintiffs' neighborhoods, which identified factors relevant to alternative sources of lead, such as the age of housing and lead paint. (ECF No. 437, PageID.34273-34274.)

Dr. Bithoney ultimately concludes that the neurocognitive harms Dr. Krishnan identified were caused by lead poisoning due to the ingestion of Flint River water.

First, Dr. Bithoney relies on the bone lead tests conducted by Dr. Aaron Specht to determine that each child was in fact exposed to significant quantities of lead. (ECF No. 330-34, PageID.15510; ECF No. 330-18, PageID.15021; ECF No. 330-17, PageID.15006; ECF No. 330-34, PageID.15035.) He explains that the negative blood lead tests taken for each Plaintiff do not indicate otherwise, because the half-life of blood lead

[2] The Court has summarized Dr. Krishnan's findings in its recent opinion regarding her testimony, *see* ECF No. 456.

in children is only approximately 10 days. (*e.g.*, ECF No. 330-34, PageID.15512.) Accordingly, blood lead tests taken long after an exposure do not provide reliable information about the severity of that exposure. *Id.* Moreover, the "thousands of micrograms of lead" revealed to have been deposited in the Plaintiffs' bones could not be explained except by a significant exposure to lead. (ECF No. 436, PageID.33952.)

Dr. Bithoney estimates what peak blood lead levels could have been by relying on the quantities of water each child likely consumed and the likely lead content of that water. Three out of four Plaintiffs "drank between 4 and 6 glasses of tap water per day," while the other drank "3 glasses of tap water per day." (ECF No. 330-34, PageID.15513.) A 2015 study by Virginia Tech University indicated that more than 40% of the water in Flint had lead levels greater than 5 parts per billion ("ppb"), and 17% had lead levels greater than 15 ppb. (ECF No. 330-34, PageID.15509.)[3] Because the samples used in that study were not representative and did not include any "high-risk homes," it is likely that

[3] The results of the sampling referred to by Dr. Bithoney are available online, here: http://flintwaterstudy.org/information-for-flint-residents/results-for-citizen-testing-for-lead-300-kits/.

the true percentage of water above the 15 ppb mark was much higher than reported. *Id.*

Dr. Bithoney explains how this data can be used to estimate the actual blood lead peaks. Suppose that a toddler drinks 1 liter (4 glasses) of water a day, with a lead content of 10 ppb. That would amount to consuming 10μg of lead every day. Children absorb between 50% and 100% of the lead they drink. (ECF No. 330-34, PageID.15514.) Someone who drank 1 liter of water with a lead content of 10ppb for three months would therefore have absorbed at least 450μg of lead. The average toddler has approximately 1.5 liters of blood in which to disperse that lead. *Id.* Accordingly, three months of consuming water with a lead concentration of 10 ppb would easily cause a toxic level of lead exposure, considering that cognitive harms have been detected at blood lead concentrations as low as 1 μg/dl.

Accordingly, Dr. Bithoney concludes that each Plaintiff was exposed to enough lead to cause the neurocognitive harms they experienced. Dr. Bithoney testifies he used family histories to rule out alternative, non-lead related causes of these harms and found no other plausible explanations. (ECF No. 436, PageID.34085-34086.) Dr.

Bithoney also tried to rule out sources of lead exposure other than Flint's water. Because neither his graduate student's report, nor his interviews of the Plaintiffs' parents yielded any plausible alternative explanations, however, Dr. Bithoney concluded that Flint River water was by far the most likely source of the lead exposure that caused Plaintiffs' injuries. (ECF No. 330-34, PageID.15517.)

**C. Injury Testimony**

In addition to his testimony regarding causation, Dr. Bithoney draws two conclusions related to the Plaintiffs' injuries. First, he explains that "many children who are Pb [lead] intoxicated do well in early childhood but then fall behind due to [the] so called 'lag effect'." (ECF No. 330-34, PageID.15518) (citing Maureen Dennis, *Developmental Neuropsychology: a developmental approach* (2d ed. 2019), at 17). Accordingly, he opines that the Plaintiffs will likely fall further behind in school as they are confronted with more complex academic challenges. *Id*.

Second, Dr. Bithoney notes that because of their exposure to lead, Plaintiffs face a higher likelihood of contracting the serious medical conditions associated with lead poisoning, such as cardiovascular

disease, hypertension, renal disease, and neurologic deficits. (ECF No. 330-34, PageID.15519.)

## II. Legal Standard

The admissibility of expert testimony is governed by Federal Rule of Evidence 702, which sets forth three requirements: (1) the witness must be qualified, (2) the testimony must be relevant, and (3) the testimony must be reliable. Fed. R. Evid. 702; *In re Scrap Metal Antitrust Litig.*, 527 F.3d 517, 528–29 (6th Cir. 2008). As the Supreme Court explained in *Daubert*, Rule 702 imposes a "gatekeeping" obligation on the courts to ensure that scientific testimony "is not only relevant, but reliable." *Daubert*, 509 U.S. at 589; *See also Kumho Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 147 (1999).

*Daubert* provides a non-exclusive list of factors courts may consider when evaluating reliability: (1) whether the theory or technique at the basis of the opinion is testable or has been tested, (2) whether it has been published and subjected to peer review, (3) what the known error rates are, and (4) whether the theory or technique is generally accepted. *Daubert*, 509 U.S. at 593; *see also In re Scrap Metal*, 527 F.3d at 529 (listing same factors). Not every factor needs to be present in every

instance, and courts may adapt them as appropriate for the facts of an individual case. *Kumho* 526 U.S. at 150.

"Rejection of expert testimony is the exception, rather than the rule." *United States v. LaVictor,* 848 F.3d 428, 442 (6th Cir. 2017) (quoting *In re Scrap Metal*, 527 F.3d at 529–30)). Nevertheless, the burden is on Plaintiffs to show by a "preponderance of proof" that the proffered expert meets the standards of Rule 702 as interpreted by *Daubert*. *Pride v. BIC Corp*., 218 F.3d 566, 578 (6th Cir. 2000) (quoting *Daubert*, 509 U.S. at 592).

## III. Analysis

VNA challenges every aspect of Dr. Bithoney's testimony. First, VNA argues that Dr. Bithoney's general causation testimony is unreliable because there is insufficient evidence of a causal relationship between lead poisoning and any of the injuries suffered by Plaintiffs. Second, it argues that Dr. Bithoney's specific causation testimony is unreliable because he (1) does not properly assess the Plaintiffs' level of exposure to lead, (2) has insufficient evidence for his conclusion that Flint's water was the source of Plaintiffs' lead poisoning, and (3) does not conduct a proper differential diagnosis. Third, VNA objects to all of Dr.

Bithoney's injury testimony as prejudicial and unduly speculative. Finally, VNA maintains that even if all of Dr. Bithoney's testimony were reliable, it would still be irrelevant under Rule 702.

Most of Dr. Bithoney's complex testimony clearly meets the standards of Rule 702 and *Daubert*. Indeed, Dr. Bithoney's deposition transcripts offer a powerful illustration of his expertise in the area of lead poisoning. Even so, VNA raises valid concerns regarding some portions of Dr. Bithoney's testimony, and his testimony will be subject to the limitations set forth below.

**A. General Causation**

VNA challenges all of Dr. Bithoney's general causation testimony. According to VNA, Dr. Bithoney has provided no evidence to suggest that there is a causal link between lead poisoning and mood disorder or mild neurocognitive disorder. (ECF No. 330-2, PageID.14202-14208.) While VNA acknowledges that there is evidence of an association between lead exposure and ADHD, it argues that mere association is insufficient to support general causation testimony. *Id.* And VNA challenges Dr. Bithoney's testimony regarding physical health conditions on both reliability and relevance grounds.

1. Lead and ADHD

Dr. Bithoney's conclusion that lead exposure can cause ADHD is reliable and well-supported. The *Toxicological Report*, which Dr. Bithoney reviewed and relied on for his conclusions (ECF No. 436, PageID.34038-34039), discusses fifteen studies all indicating "that risk of childhood ADHD increases in association with increasing PbB [lead] within the range of PbB <10μg/dl." *Toxicological Profile*, 172. An additional study focusing on bone lead concentrations found that "increasing bone lead was associated with…behaviors indicative of attention deficit hyperactivity disorder assessed at age 7-15 years." *Toxicological Profile*, 175. In his reports, Dr. Bithoney highlights studies by Lisa Chiodo and Joe Braun which draw similar conclusions.[4] *See* Chiodo (2004) and Braun (2006).

VNA relies on *Nelson v. Tenn. Gas Pipeline*, 243 F.3d 244, 253 (6th Cir. 2001) for the proposition that "an association does not mean there is

[4] VNA asserts that the Chiodo study "did not examine the relationship between lead exposure and ADHD, but rather the relationship between lead exposure and teacher-reported attention-related behaviors." (ECF No. 330-2, PageID.14205.) That is at best a misleading description of the Chiodo study, because the teachers involved were "asked to complete the Barkley—DuPaul Attention Deficit Hyperactivity Disorder (ADHD) Scale," and their answers were used to compile "a total ADHD score." Chiodo (2006), at 362.

a cause-and-effect relationship." This Court recently explained that *Nelson*'s warning does not apply to evidence of association based on epidemiological studies which account for confounding variables. *In re Flint Water Cases*, No. 17-10164, 2021 WL 5631706 at *7-8 (E.D. Mich. Dec. 1, 2021) ("*Graziano*"). That much is evident from the face of *Nelson*, which continues by noting that "before any inferences are drawn about causation, the possibility of other reasons for the association must be examined." *Nelson*, 243 F.3d at 253.

As is set forth above, many peer-reviewed studies have found a sufficiently strong association between lead exposure and ADHD to infer a causal link, and those studies carefully examined "the possibility of other reasons for the association," *Nelson* 243 F.3d at 253. For instance, the Braun study accounted for the child's (1) sex, (2) age, (3) race, (4) socioeconomic status, (5) health insurance coverage, (6) preschool attendance, (7) low birth weight and (8) ferritin (iron) levels and (9) childhood admission to a neonatal intensive care unit as potential covariates or confounding variables. *See* Braun (2006), at 1905. Nothing forbids Dr. Bithoney from relying on such studies.

VNA also cites to *Rochkind v. Stevenson*, a recent Maryland Court of Appeals decision which held that an expert witness' testimony regarding the causal link between lead exposure and ADHD was unreliable. *Rochkind v. Stevenson*, 454 Md. 277 (2017). The witness in *Rochkind* cited to an Environmental Protection Agency ("EPA") publication which found that there was "a causal relationship between [lead] exposure and attention decrements, impulsivity, and hyperactivity in children." *Id.* at 288. Because the EPA publication did not explicitly find a causal relationship between lead exposure and ADHD, the court held that the expert did not have a "sufficient factual foundation" for her conclusions. *Id.* at 290.

*Rochkind* is of limited persuasive value. The expert in *Rochkind* explained that the symptoms discussed in the EPA study were the very symptoms that constitute ADHD. The court's refusal to permit the expert to draw the reasonable inference that the EPA study supported a causal link between ADHD and lead poisoning is difficult to reconcile with the general rule that experts "need not testify to what is known to a certainty but must only state an inference or assertion derived by the scientific method." *Jahn v. Equine Serv.'s, PSC.*, 233 F.3d 382, 388 (6th Cir. 2000)

(cleaned up) (quoting *Daubert*, 509 U.S. at 592-93). But *Rochkind* is also clearly distinguishable. The expert in that case relied on a single publication which did not explicitly address ADHD, while Dr. Bithoney relies on several studies which do explicitly identify a link between lead exposure and ADHD. Accordingly, Dr. Bithoney's opinions are far better supported than those of the expert in *Rochkind*.

For these reasons, Dr. Bithoney's conclusion that lead exposure can cause ADHD meets the standards set forth by Rule 702 and *Daubert*.

2. Lead, Mood Disorder, and Mild Neurocognitive Disorder

VNA next argues that Dr. Bithoney has not provided sufficient evidence to support the conclusion that lead poisoning can cause either mood disorder or mild neurocognitive disorder. In response, Plaintiffs argue that even though Dr. Bithoney did not identify any study which *concluded* that lead exposure could cause those conditions, he properly relied on the *data* in those studies to draw his own conclusions. (ECF No. 373, PageID.24640-24641.)

Both parties forge ahead without considering the actual substance of Dr. Bithoney's reports and testimony. Dr. Bithoney nowhere opines that lead poisoning causes either mild neurocognitive disorder or mood

disorder. He does not draw that conclusion in his reports, and he does not draw it in his deposition. The Court cannot evaluate the reliability of opinions that an expert does not express.

The closest Dr. Bithoney comes to suggesting that mood disorder or mild neurocognitive disorder can be caused by lead poisoning is when he concludes that Plaintiffs' "ingestion of Flint River water is a significant cause and exacerbating factor resulting in [the] developmental, behavioral, and cognitive deficits described above by Dr. Krishnan." (*See, e.g.*, ECF No. 330-34, PageID.15517-15518.) It is arguably ambiguous whether Dr. Bithoney's reference to "deficits" was intended to refer to the symptoms experienced by Plaintiffs or Dr. Krishnan's formal diagnoses.

Plaintiffs' counsel indicated at oral argument that Dr. Bithoney would be testifying that lead poisoning can cause these diagnoses, not merely the symptoms discussed by Dr. Krishnan. (ECF No. 425, PageID.31771.) To the extent Dr. Bithoney intended to offer that opinion at all, however, it is not supported by the evidence he cites. The *Toxicological Profile* makes no mention of either "mood disorder" or "mild neurocognitive disorder." Nor does the Chiodo paper on the "behavioral signature" of lead poisoning. Indeed, the Court has been unable to find

any mention of either diagnosis in any of the sources cited by Dr. Bithoney.

To be sure, Dr. Bithoney discusses many of the characteristic symptoms of mood disorder and mild neurocognitive disorder. Links between several of those symptoms—such as difficulty regulating moods, difficulty with academic tasks, decreases in intelligence, impulsivity, and lack of focus—are well-established in the scientific literature. *See generally Toxicological Profile*, 140-176. Dr. Bithoney may testify about these findings. But Dr. Bithoney nowhere explains their relationship to the diagnoses of mood disorder and mild neurocognitive disorder. Accordingly, Dr. Bithoney may not provide general causation testimony to the effect that these particular diagnoses are known to be caused by lead poisoning. That is an opinion Dr. Bithoney neither states nor supports.

3. Lead and Other Conditions

Dr. Bithoney also opines that lead poisoning can cause a number of illnesses from which Plaintiffs do not currently suffer: cardiovascular disease, hypertension, renal disease, and neurologic deficits. The Court recently addressed the admissibility of nearly identical testimony.

*Graziano*, 2021 WL 5631706 at *7. For the reasons stated in *Graziano*, testimony regarding conditions from which no Plaintiff currently suffers is inadmissible because it is more prejudicial than probative. *Id.* (citing *United States v. Asher*, 910 F.3d 854, 860 (6th Cir. 2018)).

As in *Graziano,* Plaintiffs may request reconsideration of this decision if they obtain evidence that they are in fact likely to suffer from, or already suffer from, any of the conditions discussed by Dr. Bithoney.

4. Any Amount of Lead is Harmful Testimony

Finally, Dr. Bithoney opines that any amount of lead can be harmful. For the reasons set forth in *Graziano*, Dr. Bithoney may not testify that *any* amount of lead is harmful. He may, however, testify that there is no known toxicity threshold for lead and that lead has been shown to cause neurocognitive harms at quantities as low as 1 μg/dl of blood lead or 1 ppm of dentine lead. *See Graziano*, 2021 WL 5631706 at *3-4.

**B. Specific Causation**

According to VNA, all of Dr. Bithoney's specific causation testimony is also inadmissible. VNA organizes its objections according to the three elements of specific causation in Michigan law: (1) a toxic exposure, (2)

at a sufficient level to cause injury, (3) that in fact caused injury. *Powell-Murphy v. Revitalizing Auto Comm's Environ. Response Trust*, 333 Mich. App. 234, 250 (2020) (quoting *Lowery v. Enbridge Energy Ltd., P'ship.*, 500 Mich. 886, 1046 (2016) (Markman, C.J., concurring)). According to VNA, Dr. Bithoney cannot establish any of these elements.

As an initial matter, the Court notes that the question at issue in this motion is not whether Dr. Bithoney's testimony can prove specific causation under Michigan law. Two other experts—Dr.'s Specht and Michaels—will also provide testimony on the first two elements of specific causation. At summary judgment, the Court will consider whether Plaintiffs have raised a material question of fact as to specific causation. At this stage, the question is only whether Dr. Bithoney's opinions are sufficiently relevant and reliable to be admissible under Federal Rule of Evidence 702 and *Daubert*.

1. Exposure

VNA first argues that Dr. Bithoney cannot reliably opine that Plaintiffs were exposed to lead. According to VNA, Dr. Bithoney's opinions are unreliable because (1) they are based on unreliable bone lead tests, and (2) they discount the negative blood lead tests. In addition,

VNA argues that even if Plaintiffs were exposed to lead, Dr. Bithoney cannot establish that Flint's water was the source of that exposure.

It is clear that Dr. Bithoney can reliably opine that the Plaintiffs were exposed to lead. The Court has already addressed the reliability of bone lead scans. *In re Flint Water Cases*, No. 17-10164, 2021 WL 5356295 (E.D. Mich., Nov. 17, 2021) ("*Specht*"). For the reasons set forth in that opinion, bone lead scans are not so unreliable as to warrant exclusion under Rule 702 and *Daubert*.

Dr. Bithoney also does not discount the importance of the blood lead tests. As is explained above, he carefully explains why those results do not show that there was no exposure to lead.

VNA's third argument, that Dr. Bithoney does not sufficiently rule out other sources of lead exposure, presents a more difficult question. Crucially, there is no quantitative evidence of the lead levels in any of the Plaintiffs' homes during the relevant period. Dr. Bithoney reasons that because (1) there was a city-wide problem with lead in Flint River water and (2) careful investigation did not reveal any sources of lead that could account for Plaintiffs' high bone lead test results, Flint River water was the most likely source of Plaintiffs' exposure to lead.

VNA claims that the absence of quantitative lead measurements of Plaintiffs' water during the relevant time is dispositive, but that could not be true. Plaintiffs in toxic torts cases will rarely have access to such contemporaneous, quantitative measurements. After all, we do not ordinarily measure our environment for toxins before there is any reason to suspect that toxins may be present. While Dr. Bithoney's conclusion that Flint River water was the cause of Plaintiffs' lead exposure is admissible only if it is based on "good grounds," *Daubert*, 509 U.S. at 590, the law does not set the burden as high as VNA suggests.

The cases cited by VNA do not show otherwise. In *Polaino v. Bayer Corp.*, 122 F.Supp.2d 63 (D. Mass. 2000), an expert without any relevant experience or training opined that a mixer contained chemicals that caused the plaintiff's reactive airway dysfunction syndrome. *Id.* at 68-70. The expert had not seen the mixer, had not verified the presence of the assertedly harmful chemicals, and had not measured the plaintiff's exposure to any chemicals. *Id.* His testimony was based purely on a sequence of events that may well have been coincidental. *Id.*

The same was true in *Bland v. Verizon Wireless (VAW) LLC.,* 2007 WL 5681791 (S.D. Ia. Aug. 9, 2007). The specific causation testimony

there was unreliable because there was no evidence that the environment contained toxins or that the plaintiff was exposed to them. *Id.* at *10. The experts in *Bland* and *Polaino* thus lacked objective evidence of the fact of exposure, the degree of exposure, and the source of exposure.

That is clearly not the case here, where Dr. Specht's bone lead scans provide clear evidence of both the fact and the degree of Plaintiffs' exposure to lead. As Dr. Bithoney puts it in his deposition: "all the children had very high levels of lead, definitive levels of lead in their bones, indicating ongoing exposure…you can't argue with the fact that tens of thousands of micrograms of lead are in this child's bones." (ECF No. 436, PageID.33952.)

VNA nevertheless maintains that Dr. Bithoney did not adequately rule out other sources of lead as the cause of Plaintiffs' exposure. It asserts that "all [Dr. Bithoney] did to investigate potential alternative sources was to ask Plaintiffs' parents during a telephone call whether they knew of any alternative sources of exposure." (ECF No. 330-2, PageID.14215). But this is incorrect. Dr. Bithoney clearly did not just ask the Plaintiffs' parents whether *they* knew of any other sources of lead. Instead, as he repeatedly explains during his deposition, he questioned

each parent at length about possible alternative sources of exposure, using a process that is standard clinical practice:

> [Flint River water] is the only source I was able to identify. You know, I've done a lot of evaluation of the epidemiology of lead in a family's home and so we typically ask about lead paint and soil and all that, the age of housing, we did all that…I assure you that we did look for other sources in the parental interview. Didn't find that. Didn't find anything in the depositions. Didn't find anything, any other source other than the lead in the water.

ECF No. 436, PageID.34150-34151; *See* also ECF No. 436, PageID.34086 (followed standard clinical exposure assessment during parental interview), PageID.34153-34154 (explaining other factors that would be considered during an evaluation of lead in a family home). Dr. Bithoney also hired a graduate student to analyze potential sources of lead in Plaintiffs' neighborhoods. (ECF No. 437, PageID.34273-34274.) Only after considering all this evidence did Dr. Bithoney conclude that Flint's water was the most likely source of Plaintiffs' lead exposure.

*Daubert* "does not require perfect methodology." *Best v. Lowe's Home Ctr.'s Inc.*, 563 F.3d 171, 181 (quoting *Kumho Tire*, 526 U.S. at 152). Instead, it requires only that an expert "employ in the courtroom the same level of intellectual rigor that characterizes the practice of an expert in the relevant field." *Id.* Expert testimony is not limited to "what is known to a certainty." *Daubert*, 509 U.S. at 590; *accord Jahn v. Equine Serv's, PSC*, 233 F.3d 382, 388 (6th Cir. 2000). It is sufficient for an expert to reasonably identify the most likely cause of an exposure. *See, e.g., Jahn*, 233 F.3d at 389-91 (expert veterinarian could testify to the probable cause of a horse's death, even if he did not *know* what the cause was); *Best*, 563 F.3d at 182 (treating physician could testify to the "most likely cause" of the injury).

Plaintiffs' exposure to lead did not occur in a vacuum. While these Plaintiffs lived in Flint, the city experienced a major crisis involving the lead pollution of its drinking water. Not only did a substantial number of water samples taken throughout the City of Flint show significant lead content, during the time of the water crisis blood lead measurements taken from babies in Flint were 700% more likely to be elevated than measurements taken from babies in Detroit. Mona Hanna-Attisha,

*Umbilical Cord Blood Lead Level Disparities between Flint and Detroit*, 38 AM. J. PERINATOLOGY e26 (2020).

It is true, as VNA points out, that an expert may not rely exclusively on evidence that an environment contained a toxin to conclude that a particular plaintiff was exposed to that toxin. *Nelson v. Tenn. Gas Pipeline Co.*, 243 F.3d 244, 253 (6th Cir. 2001). As has already been noted, however, Dr. Bithoney does *not* rely on circumstantial evidence to conclude that the Plaintiffs were exposed to lead—that is shown by bone lead measurements. Once there is a known exposure, an expert may clearly consider evidence of environmental toxins to determine the most likely source of that exposure. Neither *Nelson* nor any other case holds otherwise.

VNA argues that Dr. Bithoney should have considered the fact that Plaintiffs' homes did not have lead water pipes. Dr. Bithoney did not do so because he is "not an expert in plumbing or pipes." (ECF No. 436, PageID.33981.) However, he explains that the water pipes leading into Plaintiffs' homes need not have contained lead for the Plaintiffs to have been lead poisoned by water consumption. After all, each Plaintiff regularly drank water at places other than her home. (ECF No. 437,

PageID.34289-34290.) Absent any explanation sufficient to account for the tens of thousands of micrograms of lead in Plaintiffs' bones, Dr. Bithoney concluded that Flint Water remained the most likely source of lead exposure. That inference is not so unreasonable as to warrant the exclusion of his testimony.

2. Sufficient Exposure to Cause Harm

VNA next argues that Dr. Bithoney's conclusion that Plaintiffs were exposed to *sufficient* lead to cause their injuries is unreliable. According to VNA, Dr. Bithoney does not analyze the level of exposure and instead relies only on his opinion that lead is harmful at any level.

VNA is incorrect. Dr. Bithoney relies on Dr. Specht's bone lead measurements, which quantify Plaintiffs' exposures. As is set forth above, Dr. Bithoney also explains how the available data can be used to estimate peak blood lead levels. For instance, a toddler who consumed 4 glasses of Flint water for approximately 3 months would have absorbed an estimated 450 μg of lead, which would have been dispersed over approximately 1.5 liters (viz., 150 deciliters) of blood before being deposited in the bones. (ECF No. 330-18, PageID.15025.) In light of the fact that lead is known to cause neurocognitive harms at blood lead levels

of well below 10 μg/dl, including decreases in IQ at blood lead levels as low as 1 μg/dl, it is hardly a stretch to conclude that Plaintiffs, who all consumed Flint River water for more than three months, were exposed to enough lead to cause the neurocognitive harms they experienced. *See Toxicological Profile*, at 140-176 (reviewing neurocognitive harms caused by lead exposure); Schwartz (1994) (lead exposure can cause decrease in IQ at 1 μg/dl or 1 ppm dentine lead).

Dr. Bithoney also reasons back from the bone lead measurements (which revealed lead concentrations of between 5-10 μg/g) to estimate the peak blood lead level. In a study by Linda H. Nie, children with peak blood lead measurements of over 30 μg/dl were later found to have a bone lead content of only 0.7 μg/g. Linda H. Nie et. al., *Blood lead levels and cumulative blood lead index (CBLI) as predictors of late neurodevelopment in lead poisoned children*, 16 Biomarkers 6, 517-524 (2011). Given that each Plaintiffs' bone lead measurement was substantially higher, this may suggest that their peak blood lead levels exceeded 30 μg/dl.

To be sure, Dr. Bithoney's estimates are just that: estimates. But it is clear that Plaintiffs were exposed to enough lead to leave tens of

thousands of micrograms of it deposited in their bones. Given the evidence that each of the symptoms Plaintiffs have experienced can be caused by very low levels of lead exposure, Dr. Bithoney's conclusion that each Plaintiff was exposed to enough lead to cause those harms is a reasonable inference from the available evidence.

Accordingly, Dr. Bithoney's testimony regarding the second element of specific causation is admissible.[5] For the reasons set forth above, however, this testimony is again limited to (1) ADHD and (2) the neurocognitive symptoms discussed in Dr. Bithoney's reports and testimony. Because Dr. Bithoney has not explained what exposure (if any) would be sufficient to cause mood disorder or mild neurocognitive disorder, he may not testify that the Plaintiffs were exposed to enough lead to cause those disorders.

[5] VNA also argues that Dr. Bithoney should not rely on any studies which involve blood lead measurements because he himself has disclaimed reliance on blood lead measurements. This argument is completely without merit. Dr. Bithoney does not argue that blood lead tests are unreliable, only that blood lead is quickly deposited into the bones.

3. Cause in Fact

VNA next argues that Dr. Bithoney cannot reliably opine that the Plaintiffs' exposure to lead in fact caused their injuries.

The Sixth Circuit has explained that a specific causation witness must first "rule in" exposure to a toxin as a possible cause of the alleged injury, and then "reliably rule out the rejected causes," i.e., causes other than the toxic exposure. *Pluck v. BP Oil Pipeline Co.*, 640 F.3d 671, 678 (6th Cir. 2011) (quoting *Tamraz v. Lincoln Elec. Co.*, 620 F.3d 665, 674 (6th Cir. 2010)). This process is known as a "differential diagnosis." *Id.*

It is evident that Dr. Bithoney "rule[d] in" lead exposure as a cause of the Plaintiffs' injuries. *Id.* The question is therefore whether Dr. Bithoney adequately ruled out the alternatives. VNA claims that Dr. Bithoney did not even consider any alternatives, but that is clearly untrue. Dr. Bithoney conducted extensive interviews with each Plaintiff's parents to establish their medical, genetic, and social backgrounds. (ECF No. 436, PageID.33888-33889). Those interviews clearly investigated plausible alternative causes for the Plaintiffs' injuries. (*See id.* (considering genetic, social, and medical histories); ECF No. 330-17, PageID.15003 (considering maternal drug and alcohol use). Dr. Bithoney

also reviewed previous lab tests and other medical records for possible alternative causes. (*E.g.,* ECF No. 330-19, PageID.15034). The Sixth Circuit has held similar differential diagnoses to be sufficient. *Hardyman v. Norfolk & Western Railway Co.*, 243 F.3d 255, 260-262 (6th Cir. 2001) (reversing district court's exclusion of expert witness, finding differential diagnosis sufficient where doctor questioned plaintiff about other activities which could have caused symptoms and examined medical and employment histories).

The only difficulty with Dr. Bithoney's approach to the differential diagnosis is that he does not spell it out in his reports. Thus, he testifies *that* he took a genetic history, but not which genetic causes he ruled out; he lists information related to maternal drug and alcohol use but does not explain that he collected it to rule out fetal alcohol syndrome.

This problem with Dr. Bithoney's reports does not render his methodology unreliable. It is clear from his testimony that Dr. Bithoney conducted a standard differential diagnosis. The purpose of the Court's gatekeeping function is to exclude "expertise that is *fausse* and science that is junky." *Kumho*, 526 U.S. at 159 (Scalia, J., concurring). That does not include scrutinizing an expert's reports for particular catchphrases.

What matters is not whether Dr. Bithoney used the words "differential diagnosis" in his reports, but whether he conducted one. His reports and deposition show that he did. To the extent that it is unclear whether Dr. Bithoney excluded any particular cause, he can clarify his methods at trial. *See Thompson v. Doane Pet Care Co.*, 470 F.3d 1201, 1203 (6th Cir. 2006) (Rule 26 contemplates that experts "will supplement, elaborate upon, [and] explain" the conclusions in their reports at trial).

VNA argues that even if Dr. Bithoney did conduct a differential diagnosis, his analysis was insufficient because it did not consider every plausible alternative cause. For instance, VNA claims that Dr. Bithoney should have considered whether a 2011 spike in the lead content of Flint's water caused the Plaintiffs' injuries. (ECF No. 330-2, PageID.14247.) Setting aside the fact that such an investigation would be scientifically impossible—bone lead measurements do not establish a date of exposure—it is uncontroversial that specific causation experts need not rule out every conceivable alternative cause of an injury. To the contrary, "the fact that several possible causes might remain uneliminated only goes to the accuracy of the conclusion, not to the soundness of the methodology." *Jahn*, 233 F.3d at 390 (6th Cir. 2000) (quoting *Ambrosini*

*v. Labarraque*, 101 F.3d 129, 140 (D.C. Cir. 1996)) (cleaned up); *accord In re: E.I. Du Pont de Nemours and Comp. C-8*, No. 2:13-CV-170, 2016 WL 659112, at *30 (S.D. Oh. Feb. 17, 2016); *Matthews v. Novartis Pharm. Corp.*, No. 3:12-cv-314, 2013 WL 5780415, at *5 (S.D. Oh. Oct. 25, 2013)).

Accordingly, Dr. Bithoney's differential diagnosis is admissible.

**C. Injury**

VNA next objects to Dr. Bithoney's two injury-related opinions: that all Plaintiffs face an increased risk of future medical complications, and that their neurocognitive symptoms are likely to worsen as they grow older. The first opinion is inadmissible because, as is set forth above, evidence involving conditions from which the Plaintiffs do not suffer is more prejudicial than probative. Dr. Bithoney's prediction that the Plaintiffs' neurocognitive difficulties will increase over time is clearly admissible, however.

Dr. Bithoney has treated lead intoxicated children just like these Plaintiffs for over four decades. He therefore has an unparalleled understanding of the difficulties they are likely to face as they grow older. Medical experts are permitted to rely on such professional experience. *Dickenson v. Cardiac and Thoracic Surgery of Eastern Tenn.*, 388 F.3d

976, 982 (6th Cir. 2004); *In re Heparin Prod. Liab. Litig.*, 803 F.Supp.2d. 712, 745 (N.D. Oh. 2011); *Seifert v. Balink,* 372 Wis.2d 525, 566 (2017) (citing *Dickenson*, 388 F.3d at 980). And Dr. Bithoney provides additional support for his view by citing to publications explaining that children often "grow into" neurocognitive deficits that are not immediately visible after a brain-injuring event.[6] (ECF No. 330-17, PageID.15014.) His testimony regarding the likely development of the Plaintiffs' neurocognitive symptoms is therefore sufficiently reliable to be admissible.

**D. Relevance**

Finally, VNA argues that the entirety of Dr. Bithoney's testimony is irrelevant under Rule 702 because it does not "fit" Plaintiffs' case. (ECF No. 330-2, PageID.14250-14252.) VNA reasons that because Dr. Bithoney's testimony does not prove that *VNA* caused the Plaintiffs' injuries, it is not relevant for Plaintiffs' case against VNA. *Id.*

This argument is meritless. Evidence is relevant for purposes of Rule 702 when there is a "factual issue in dispute that expert testimony

[6] VNA objects that these studies do not specifically address lead poisoning, (ECF No. 330-2, PageID.14248), but Dr. Bithoney's professional experience provides that link.

can clarify." *United States v. LaVictor*, 848 F.3d 428, 442 (6th Cir. 2017) (citing *Lee v. Smith & Wesson Corp.*, 760 F.3d 523, 527-28 (6th Cir. 2014)). No individual expert is required to singlehandedly prove Plaintiffs' case against VNA. Dr. Bithoney's testimony goes to key elements of Plaintiffs' toxic torts claim. Accordingly, it is plainly relevant.

## IV. Conclusion

For the reasons set forth above, VNA's motion to exclude Dr. Bithoney's opinions and testimony is GRANTED IN PART and DENIED IN PART.

IT IS SO ORDERED.

Dated: December 9, 2021
Ann Arbor, Michigan

s/Judith E. Levy
JUDITH E. LEVY
United States District Judge

**CERTIFICATE OF SERVICE**

The undersigned certifies that the foregoing document was served upon counsel of record and any unrepresented parties via the Court's ECF System to their respective email or First Class U.S. mail addresses disclosed on the Notice of Electronic Filing on December 9, 2021.

s/William Barkholz
WILLIAM BARKHOLZ
Case Manager